

Accelerator Systems Division Highlights Ending November 4, 2005

Installation

Craft Snapshot 11/1/05

ASD productive craft workers	41.0
Foremen (Pd by 15% OH)	5.0
HSM management (Pd directly)	3.0
TOTAL AMSI WORKERS	49.0
Less WBS 1.9, 1.2 etc	7.0
Less absent	1.0
TOTAL PD BY ASD/ORNL DB WPs	33.0

Accelerator Physics

- V. Danilov, A. Aleksandrov, and S.H. Kim are working with RF group members on extensions of the adaptive feedforward algorithm for beam loading compensation in the linac. S. Kim is assembling a computer model of the system
- Applications programs for Ring commissioning are being developed and refined. These applications include ring closed orbit correction, ring optics measurement and correction, a general tuning knob tool, a BPM waveform viewer, and transport line and ring energy control via the Energy Manager program
- Linac dump line optics have been developed for the laser stripping experiment. Two optics have been produced: one works for transport through the apparatus to the linac dump with stripping magnets unpowered, and other has reduced vertical beta-function at the laser/particle beam interaction point.
- Our prototype nanocrystalline diamond stripper foil has been in use for routine PSR production since Sunday Oct. 23 and it continues to perform well. This is good news for the SNS project.
- The ring lecture series, designed to train operators and physicists for the upcoming ring commissioning, begins next week. There will be two 1-hour lectures per week until mid-December.

Operations

Ion Source

- The SNS external antenna source equipped with a hollow anode electron injector has produced close to 50 mA H- beam for 200 microsecond long pulses at 10 Hz. This remarkable performance appears to be uncesiated because we are currently not able to heat the cesium collar sufficiently for releasing cesium. Several technological solutions are in the works to enable cesiations. The emittance remains to be determined.
- DESY has received our transformer that was required to install our RF amplifier on the European AC.

Survey and Alignment

HEBT:

Scraper flanges mapped for either X or Y in the HEBT collimator area.

RTBT:

Map fiducials on QH12.

Map harp flanges on rad-hard test stand.

ASD Network:

HEBT direction sets completed.

RTBT direction sets underway.

Ring direction sets completed.

HEBT tracker observations completed.

RTBT tracker observations are continuing.

Miscellaneous:

Build tracker cart and install CPU, controller, and power supply for tracker 673 in the Target.

Tracker 784 disassembled, moved from the HEBT to the RTBT, and reassembled.

Tracker 673 ADM offset checked.

2 Brunson transits field calibrated.

Drawing/Data Base Update

S & A is in the process of reorganizing and updating drawing and data base files.

Mechanical

Ring Installation

- The HEBT beamline drift pipes DP24, DP30, DP32 and DP34 were installed.
- The HEBT beamline diagnostics WS32 and BCM32 were installed.
- The HEBT beamline sector valve SG32 support is being modified for installation.
- The Ring Collimator straight section beamline was successfully leak tested and placed under vacuum.
- The Ring Extraction straight section beamline installation was completed and leak testing was started.
- The RTBT beamline drift pipes DP01 and the ceramic break spool were installed.
- The RTBT beamline from the Lamberton to the EDUMP diagnostics was leak tested and placed under vacuum.
- The RTBT EDUMP beamline drift pipe DP01 was modified and installed.
- The RTBT EDUMP window assembly installation continued.
- The RTBT Collimator #1 shielding installation continued.
- The RTBT Collimator #2 shielding was received and being painted.
- The RTBT quad magnets' utility installation continued.
- The Target quad magnets' tunnel buss was installed.
- The Target HARP vessel was set on the test stand and being aligned.
- The Target quad DURATEK shielding blocks (72) were received

Water Systems Installation

- The HEBT LDRD magnet cooling lines were installed.
- The Ring half-cell cooling manifolds' modifications are in progress.
- The Ring Service Building PFN cooling lines' installation was completed.
- The Ring magnets' cooling skid pump is out being repaired.
- Installation of RTBT 21Q40 magnets' water connections was completed.
- Installation of RTBT EDUMP 30Q44 magnets' water connections was completed.
- Installation of RTBT Target quad utility connections continued.
- Test and checkout of the RTBT service building PS cooling system continued.

Electrical

- All six injection chicane magnet power supplies have been operated and commissioned along with their associated magnets. This includes integration with the EPICS control system and calibrations. This completes testing of 35 of 54 power supplies needed for the Ring ARR. 31 additional Ring corrector power supplies have been operated and commissioned along with their associated magnets. This includes integration with the EPICS control system – testing is now complete for 94 of the 134 RSB correctors. Next week testing should commence for the 14 extraction kicker power supplies and for the 4 remaining RTBT magnets needed for the ARR.
- All RSB Diagnostics and Vacuum cabling and terminations needed for the ARR are now complete. RTBT vacuum and diagnostics cable pulling are underway, as well as ac power installation in the RTBT SB.

RF

Linac HPRF

- A water leak was discovered on the DTL2 klystron and traced to a bad compression fitting under the lead shielding. The fitting was tightened, the oil was pumped and filtered for water and replaced. This klystron will be ready to operate pending the repair of a faulty tank interlock. An X-ray survey must be performed upon powering up.
- A faulty filament power supply was replaced on SCL transmitter 17. Actions are being undertaken to remedy all faults uncovered during the last run before the next one begins.
- In the RFTF the Thales 402 MHz klystron was replaced with an E2V unit. Testing for comparison should begin early next week. The tested E2V tube will become a "ready spare" to be located in the DTL section of the Klystron Gallery.

Linac LLRF

- Tests were conducted on the SCL to confirm the benefit of a ramp-up of the feedback gain during the first 50 us after the cavity fill. Up to now there has been a fixed, scalar gain setpoint that

applies whenever feedback is enabled. The new gain ramp reduces the transient that occurs at the transition from open-loop to closed-loop operation at the end of the cavity fill.

- Hengjie Ma has demonstrated in the lab a prototype beam loading compensation scheme that requires measurement of the closed-loop system step response and can provide full compensation in one step. That is, learning over many pulses is not required. This work will continue with high priority with the goal of deployment in the Linac prior to resuming beam operations in December.
- Build out of the CLO LLRF Lab has started. Electricians are installing AC power and network distribution and should finish their work in about 2 weeks.
- It has been agreed that the RF Group technicians will occupy 1/2 of the existing blue trailer 6-plex when they move out of the RFTF after Nov 30

Ring RF:

- Brookhaven visitors Larry Hoff and Kevin Smith worked with us to get the Low Level RF system properly configured.
- We are now running Station RF12 at 1 MHz with 7 kV per gap driven from the Low level RF System operating in Closed Loop mode and under EPICS control.
- Station 21 has been configured for 2 MHz operation and is operating simultaneously with Station 12 in closed loop mode under EPICS control.
- Work is progressing on the remaining two stations

Cryo Systems

- Cryomodule 23 has been installed, cooled down and tested.
- Multipacting in two of the cavities' couplers slowed the processing, but within a few days full pulse length and high power were reached in all four cavities.
- Gradients higher than 17 MV/m were attained in all cavities. The cryomodule is now operational and its limits will be tested on November 19.
- Cryomodule 5 has been warmed up and the tuners are being reset to bring the cold frequencies within range both at 4.2 and 2.1 K.
- New recovery compressor in operation

Beam Diagnostics

BPM:

Wire Scanners:

BLMs:

Foil Video systems:

- The timing card has been integrated in to the Video Foil monitor system. Software support for the hardware trigger has been developed and reliable image acquisition has been demonstrated under simulated commissioning conditions.
- A new EDM screen that includes system controls has been produced and is under test.
- A quote for a spare camera system has been received. Due to the tight budget this year, we will run commissioning without a spare camera but we will order an unmatched controller with sync capability.
- Two dual-Opteron server systems have been ordered for the target viewscreen system.
- Cabling for the target system is being finalized and a cable seal technology has been identified.
- Fiber for the optical trigger has been received, but the vendor is late in delivering the trigger units themselves.

BCM:

- Ring BCM ready to be installed for integration testing starting Monday.

Controls

- The emphasis has been on Ring installation and testing, as well as the preparation and approval of test plans for the upcoming ARR and run.
- Communication cable installation is complete in the Ring Service Building except for a couple of punch list items. The Davis-Bacon electricians doing communication cable installation have now moved to the RTBT Service Building.
- The Ring vacuum field cable installation is also nearing completion. Most cold cathode gauges and thermocouple gauges have been checked out. Ion Pump and gate valve checkout will begin next week. Ring vacuum software including PLC logic and EPICS application are 95% done; the screens still need modifications for better friendliness.

- The HEBT collimator scraper motors were tested and measurements taken to allow the operator to accurately position the foils from EPICS screens. The constants for the stepper motor drives and motor records are in the process of being verified. Operator screens are 70% complete.
- The momentum dump mechanism was found to have too much play and this will be investigated by the Mechanical Group. The test plan for these was updated to incorporate lessons learned. The motors run fine so essentially these tests have been completed. Testing the momentum dump water skid controls is also complete. Only one skid remains to be cabled and tested. To improve an electrical noise problem, the 24VDC drop resistors are being removed from the Linac Dump TC to MPS wiring. Details of the HPRF test plan are also nearly complete.
- Two Ring RF cavities (one "harmonic 1" and one "harmonic two") were successfully operated this week with feedback loops closed and "protection" enabled. This required calibration of the drive signals, the amplification "chain" of amplifiers, the reference signal from the cavities and the readback "chain" of electronics. The "protection" circuit (a window comparator) can only work properly if the drive and readback signals are calibrated. All LLRF control and most of the HPRF control were via EPICS screens. Tuning was done using the EPICS waveform readbacks, rather than signals displayed locally on oscilloscopes, giving confidence that the system could have been operated from the control room. A remaining loose end is remote display of an oscilloscope displaying the wall current monitor signal. This is needed for "timing in" the ring revolution frequency using beam. This is being worked on.
- Phase 3 PPS will include certification of the Linac, HEBT, Ring, and RTBT. It will not include the critical device DH-13 in the RTBT and will not include the Target. Considerable progress has been made toward phase 3 certification in preparation for the ARR in December: Field work for all segments (Linac, HEBT, Ring, and RTBT) is complete. PLC programming for all segments is 95% complete and the EPICS screens and archiver for all segments are 50% complete. Integration testing for all segments is 75% complete
- All of the CHL and Cryomodule IOCs were upgraded to the current official SNS version of VxWorks (i.e., VxWorks 2.6). Several minor problems were uncovered during the rebooting of these IOCs and most of these have been corrected.
- Laboratory tests of the LEBT/MEBT Chopper controller prototype continued.
- The Controls team continues to contribute to Target Controls installation and testing. A technician has been added to the I&C Team for this work, and an offer is about to be made to an I&C engineer. The focus this week has been: getting all valves to operate from the EPICS screens; making sure temperatures, pressures, and flows are reading correctly and with the correct units; getting level probes calibrated and operating reliably; adding more logic to the PLC programs, more PVs to the EPICS databases, and making corresponding changes to the operator screens and organizing reference documents (procedures and check lists) and alarm handling to support integrated system testing.
- David Meyer of Sverdrup (Tulahoma) has been working on site in the target control room to expedite this time-critical effort. This eliminates having to synchronize changes between Tulahoma and Oak Ridge; turn-around time between identifying a problem and fixing it is much shorter. This has proven effective and productive. A disappointing number of mechanical and electrical problems are still being found in the target system installation.